

EM Radiation

Name: _____ Date: _____ Block: _____

Electromagnetic Radiation

Electromagnetic waves are waves of energy sent out in all directions.

These waves are composed of an electric field (*electro~*) and a magnetic field (*~magnetic*).

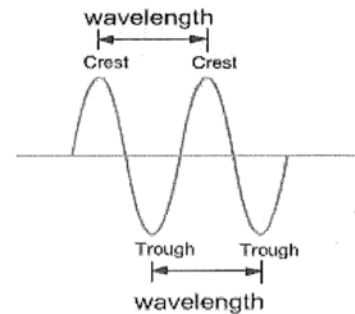
Electromagnetic radiation can be thought of as light

- Photons:
- packets of light
 - Have different wavelengths
 - "packages" of energy

Properties of EM Radiation:

There are various types of electromagnetic (EM) radiation and they can be compared by the following properties:

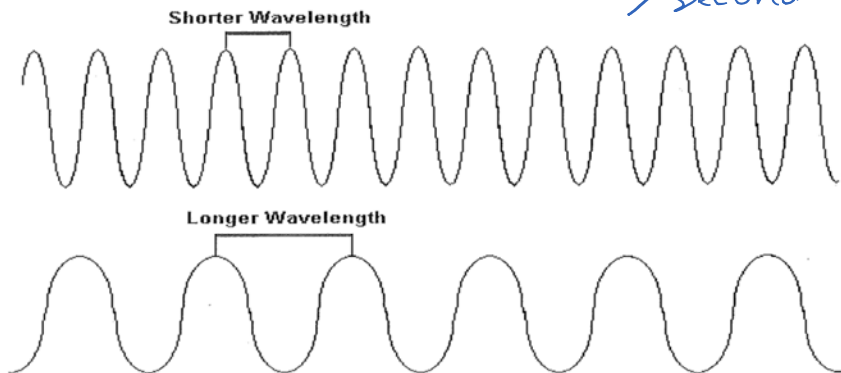
1. **Wavelength** (Symbol: λ "lambda")
- This is the distance from one wave to the next.



2. **Frequency** (Symbol: f)
- The number of wavelengths that pass a point in one second.
 - Measured in hertz (Hz) = cycle/second

shorter λ
= higher f

longer λ
= lower f



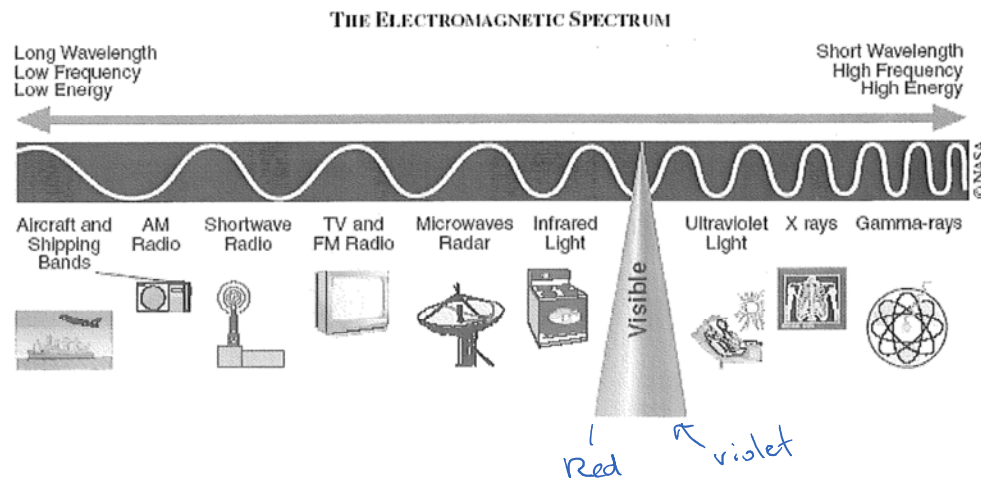
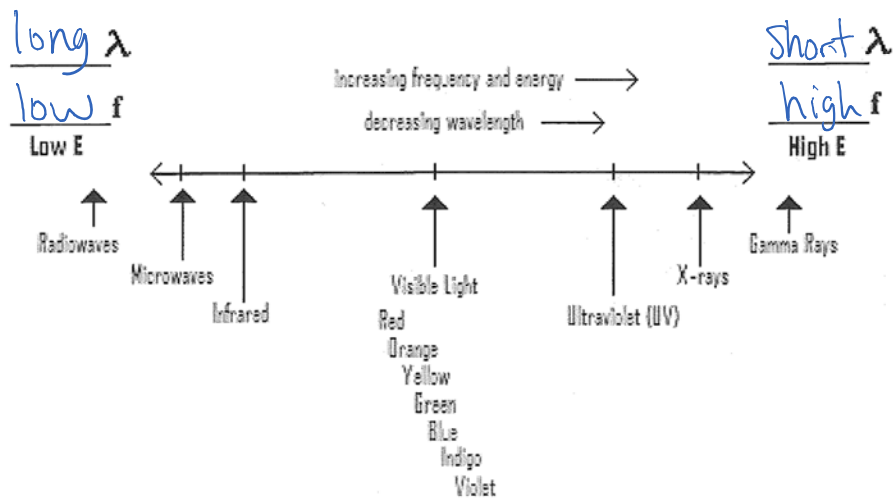
3. **Energy** (Symbol: E)

shorter wavelength = higher frequency = higher energy

Radiation 10

Electromagnetic Spectrum

When all types of EM radiation are arranged according to their characteristics, they show the **Electromagnetic Spectrum**.



ROY G BIV - order of rainbow colours

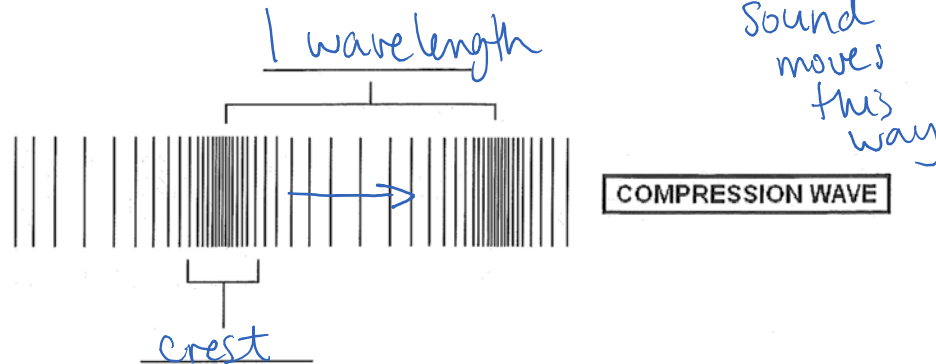
Types of Waves

Types of Waves

There are two different types of waves:

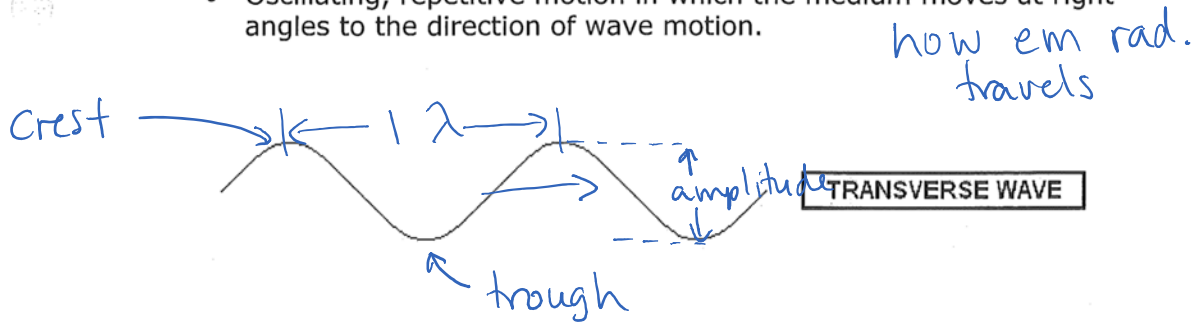
1. COMPRESSIONAL WAVES

- Oscillating, repetitive motion that moves in the same direction as the wave motion.



2. TRANSVERSE WAVES

- Oscillating, repetitive motion in which the medium moves at right angles to the direction of wave motion.



In the diagram above: label the wavelength, crest, trough, and amplitude.

Below: Draw the slinky demo movement of a transverse wave here:

Electromagnetic Radiation Questions

Blue light	UV	Infrared	Red Light	Yellow Light	X-rays	Microwaves	Radio waves	Gamma rays
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1. Arrange the above types of electromagnetic radiation according to...

a. Increasing energy (E). (i.e. ^{lowest} highest to ^{highest} lowest)

low: rad, micro, ir, red, yellow, blue, UV, x-ray, gamma - highest

b. Decreasing frequency (f). (i.e. highest to lowest)

opposite to above (gamma highest 2)

c. Increasing wavelength (λ). (i.e. shortest to longest)

same as b (gamma is shortest)

2. In the EM spectrum, visible light is divided up into the seven different colours.

a. List the colours in order from longest wavelength to shortest wavelength.

R O Y G B V

b. what is an easy way for you to remember the order of the colours?

Roy G Biv

3. Consider four types of electromagnetic radiation:

A - has a wavelength of 2m

B - has a wavelength of 10 cm

C - has a wavelength of 700 nm

D - has a wavelength of 250 nm

2m

0.1m

$= 700 \times 10^{-9} \text{ m} = 0.0000007 \text{ m}$

$= 0.00000025 \text{ m}$

a) Which has the longest wavelength? A

d) Shortest wavelength? D

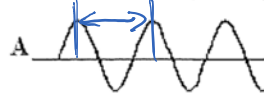
b) Which has the highest frequency? D

e) Lowest frequency? A

c) Which has the lowest energy? A

f) Highest energy? D

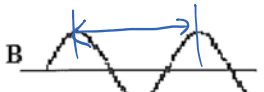
4. Use a ruler to measure the wavelength of each diagram.



A - 1.25 cm

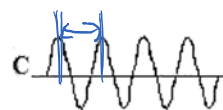
B - 2.05 cm

C - 0.75 cm



a) Which wave diagram (A,B,C) has the lowest frequency?

B (longest λ)



b) Which wave diagram (A,B,C) would have the highest energy?

C (highest ν shortest λ)